STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

DOCKET NO. 2020-125-E

IN THE MATTER OF:	)	
	)	
Application of Dominion Energy South	)	**DIRECT TESTIMONY OF**
Carolina, Incorporated For Adjustments	)	**EDWARD G. (TED) McGAVRAN III, P.E.**
in the Company's Electric Rate Schedules	)	
and Tariffs	)	

ON BEHALF OF THE

SOUTH CAROLINA ENERGY USERS COMMITTEE

AND

SOUTH CAROLINA DEPARTMENT OF CONSUMER AFFAIRS

November 10, 2020

Q. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Edward G. (Ted) McGavran III, P.E., 220 Cape August Place, Belmont, North Carolina 28012.

Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS PROCEEDING?

A. I am testifying on behalf of the South Carolina Energy Users Committee ("SCEUC") and the South Carolina Department of Consumer Affairs ("DCA").

Q. WERE YOUR TESTIMONY AND APPENDIX PREPARED BY YOU OR UNDER YOUR DIRECT SUPERVISION AND CONTROL?

A. Yes, they were.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND RELEVANT EMPLOYMENT EXPERIENCE.

A. I have a Bachelor of Science in Electrical Engineering from North Carolina State University. I am licensed as a Professional Engineer in South Carolina and, North Carolina, as well as a number of other states. I have been licensed in both Carolinas since 1989. I worked for North Carolina Electric Membership Corporation while at NC State as a Power Supply Technician doing analysis of substation and transmission line cost estimates and long-range planning, deploying a statewide load management system and working on issues related to the Catawba Nuclear Project Agreement. Upon graduation I joined Electrical Consulting Engineers in Charlotte, NC and worked as a project engineer until 1991. My duties there included transmission and substation design projects, system planning and feasibility studies, and Environmental Reports, all for electric coops in the southeast. In 1991 I started McGavran Engineering and continued to do the same types of projects but expanded into other areas including telecom and fiber optic system designs, pole attachment and rate contracts and disputes, siting and routing of transmission lines and substations, system protection studies, and other engineering items for electric coops, municipal systems, and industrial and military clients. I got into the renewable energy field in 2010 and have done interconnection and system designs, cost estimates, feasibility studies and project development, mostly with solar projects throughout the US but have worked on large wind projects as well as the Engineer of Record for projects ranging from small rooftop to large utility scale projects in excess of 100 MW. I sold the business in 2016. I have been an independent consultant since then. Additional details regarding my education and work experience are set out in Appendix A of this testimony.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMSSION?

A. Yes. I testified in Bridgestone Americas Tire Operations, LLC v. Dominion Energy South Carolina, Inc., Docket No. 2020-63-E on behalf of Bridgestone Americas Tire Operations.

Q. HAVE YOU REVIEWED DOMINION ENERGY SOUTH CAROLINA'S APPLICATION AND DIRECT TESTIMONY?

A. Yes.

Q. PLEASE DESCRIBE THE SCOPE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony in this proceeding is to discuss the basis on which the transmission infrastructure was justified in 2008; costs to be passed on to the ratepayers in South Carolina; and DESC's justification today in light of the cancellation of both V.C. Summer Nuclear Station ("VCSN") units. The VCSN units were absolutely the driving force for this infrastructure to be built and the costs passed on to the ratepayers. My testimony will demonstrate that while there is benefit even in light of the cancellation of both VCSN units, the cost of the transmission infrastructure far exceeds the benefits required to deliver reliable service to the same customer base that existed prior to the cancellation of the units.

Q. PLEASE PROVIDE THE COMMISSION AN OVERVIEW OF TRANSMISSION INFRASTRUCTURE DESC SEEKS TO PLACE IN RATES.

A. There is a significant amount of transmission infrastructure that has been constructed since 2008 to support the installation of VC Summer Nuclear plant units 2 and 3. (VCSN 2, VCSN 3). These projects were constructed to effect reliable and economic power flow from plant units 2 and 3 throughout the system in order to deliver power to the DESC distribution system. These upgrades also were intended to enhance power flow between DESC and neighboring utilities which at the time were, Duke Energy, Progress Energy, Southern Company, and Santee Cooper, all of which interconnected with the DESC system. Santee Cooper is the prime power supplier and Central Electric Power Cooperative is the Generation and Transmission provider for the electric cooperatives in South Carolina. The Public Service Commission held in Order No. 2018-804 that DESC would be permitted to seek recovery of the cost of transmission infrastructure constructed to support the installation of VCSN 2 and 3 in the amount of $322 million in a subsequent proceeding. Order No. 2018-804 at pages. 53 – 54. According to DESC's application, the requested transmission costs have increased to $345 million. Application Exhibit C-1, page 42.

Q PLEASE ELABORATE ON YOUR QUALIFICATIONS TO RENDER YOUR OPINON.

A. My experience in working with both Federal Energy Regulatory Commission ("FERC") interconnection procedures (Small Generator Interconnection Process (SGIP) for generation 20 MW and below and Large Generator Interconnection Process (LGIP) for projects greater than 20

MW) allows me to make expert comments on the analysis done to effect the interconnection of both VCSN units to the DESC (SCE&G) system. I have also worked with interconnections on utility grids throughout the southeast that include solar, wind, and natural gas projects at levels from 5MW – 500 MW and at voltages 12.5 kV to 345 kV.

Q. PLEASE DESCRIBE THE INITIAL JUSTIFICATION FOR THE TRANSMISSION INFRASTRUCTURE.

A. In Docket No. 2008-196-E, Hubert Young, Manager of Transmission Planning for SCE&G at the time, provided testimony and accompanying studies detailing the justification for all the transmission projects as a part of the construction of the VCSN 2 and 3. Mr. Young's testimony in Docket No. 2008-196-E is attached hereto as Exhibit 1 to my direct testimony.

The planning was driven by two criteria, one external and one internal. The external criteria were Nuclear Energy Regulatory Commission ("NERC") requirements for system performance and reliability. Those requirements are the same for all operating investor owned utilities in the United States. The controlling authority here is FERC Order No. 2003 which mandates the studies attached to Mr. Young's 2008 testimony be done to support the interconnection of generation on any system. Those studies are attached and are considered reasonable and typical for projects of the magnitude of VCSN 2 and 3. See Exhibits HCY 1 – 8 to Mr. Young's 2008 testimony attached hereto as Exhibit 2 to my direct testimony.

The internal criteria are set by SCE&G's Long Range Planning Criteria. Generally speaking, the Long Range Planning Criteria calls for a design that allows the transmission system to handle the following situations:

- Short time overloads, low voltages, and local loss of load.

- Switching and re-dispatching of all non-radial loads serviceable with reasonable voltages.
- Lines and transformers are operating within acceptable limits.

Individual contingencies are listed in Mr. Young's 2008 testimony and for brevity are not repeated here. Also, these same long range planning criteria are detailed in Mr. Young's Exhibit HCY 8, a copy of which is attached hereto in Exhibit 2 to my direct testimony.

Q. DESCRIBE THE PLANNING ISSUES SCE&G HAD TO ADDRESS IN CONSTRUCTING THE TRANSMISSION INFRASTRUCTURE AS A PART OF THE CONSTRUCTION OF VCSN 2 AND 3.

A. The installation of VCSN unit 1 was done in the late 1970s. The installation of VCSN 2 and 3 represented an enormous resource on SCE&G's entire system and affected not just the SCE&G system but power flow throughout the region that would impact power flow in both Carolinas and Georgia. Based upon Mr. Young's testimony in Docket No. 2008-196-E as well as my own experience working with electric co-ops in the area, this project had impacts on power flows on the Bulk Electric System ("BES") down to the distribution level throughout the state, including not only SEC&G's system but also the systems of the electric cooperatives, Santee Cooper, Duke and Progress. In addition, these projects would affect fault current levels, nominal system voltages, and overall system source reliability, requiring additional costs to address.

Most of the impact of the construction of the transmission infrastructure as a part of VCSN 2 and 3 would be positive. However, the construction of this transmission infrastructure would require additional investment. The resulting increased fault levels would trigger additional investment to upgrade equipment and protection systems to accommodate increased fault levels. We saw the need for these added investments in North Carolina on co-op systems throughout the state as the McGuire, Shearon Harris, and Catawba nuclear projects came on line in the early 1980s. So, any effect listed in any of these studies is not limited to just the generation owner's system. Any utility that has a physical connection to the SCE&G (DESC) system would be affected similarly. That would include Santee Cooper which owned 45% of the VCSN project.

Q. PLEASE DESCRIBE THE TRANSMISSION INFRASTRUCTURE INSTALLED AS A PART OF THE CONSTRUCTION OF VCSN 2 AND 3 BEGINNING IN 2009.

A. Located in Fairfield County, SC the VCSN plant sits essentially in the middle of the state. It is located centrally in the old SCE&G service area. The area has two major load centers which are the Columbia area and in general the Charleston/low country area. To serve this load from VCSN 2 and 3 required 4 new 230 kV transmission lines as well as the construction of a new major switchyard at the plant to accommodate these line exits. This new switchyard would eventually terminate the existing 6, 230 kV transmission lines as opposed to the existing unit 1 switchyard.

VCSN 2 was scheduled for an in service date of 2015 and studies were run based on a 2015 summer peak. A base case and several contingencies were run. The transmission planning used a least cost planning model for the transmission of additional electric power. One of the findings was the "overstressing" of breakers. VCSN 2 required two new 230 kV lines to the Columbia area to serve load there.

One of the 230 kV lines was rerouted to serve load in the I-77 area between Columbia and Blythewood which was growing rapidly. As I did planning for Fairfield Electric at the time I can attest to that being the case. We were and are seeing subdivision growth and commercial growth in this area.

Based on Mr. Young's 2008 testimony, only 25.8% of the cost of the rerouted line was to support local load growth in the I-77 area and 74.2% of the cost was for bulk power delivery associated with VCSN 2. (Pages 15-16 of Mr. Young's 2008 testimony).

VCSN 3 was scheduled for an in service date of 2016 (summer) with two major 230 kV transmission lines scheduled for in service at that time going to the Charleston area. Additional substation infrastructure was planned for the low country area at St. George, South Carolina with additional 230 kV infrastructure to deal with local power flow issues.

VCSN units 2 and 3 were planned and designed originally for 1,165 MW each. Later on, in the planning process that capacity was reduced to 1,117 MW apiece. Per the revised system feasibility studies and the testimony of Mr. Young this did not alter the transmission planning assumption which is reasonable.

According to Mr. Young's testimony in Docket No. 2008-196-E, it was projected that load would be apportioned in the two load centers as follows at time of installation of both units:

Columbia: 2,110 MW

Charleston: 1,960 MW.

Generally, the load flow on the system is from North to South. North being defined as the Midlands area around Columbia and up into Chester County and south being defined as down to the Charleston and Low Country area. So, in effect it is as much east to west as it is north to south, the greater load being in the Midlands/Columbia area.

In all of these studies all interconnected utilities have participated in the analysis. That would include not just SCE&G (DESC) but also Southern Company, Santee Cooper, and Duke Energy. These are the major utilities that have interconnections with DESC and have power flow that is affected by power flow in the DESC system.

Q. OTHER THAN TO ACCOMODATE THE INCREASED CAPACITY GENERATED BY VCSN 2 AND 3, IS THERE ANY OTHER JUSTIFICATION FOR CONSTRUCTING THE TRANSMISSION INFRASTRUCTURE YOU HAVE DESCRIBED?

A. No. All these major projects were undertaken due to one system change and that is the installation of VCSN 2 and 3. Absent that reality there is no other justification for such an enormous transmission system expansion to be undertaken. Load flows between connecting utilities and the ability to transfer major blocks of load on the BES would not require these upgrades for decades, if ever. Since construction of VCSN 2 and 3 has been abandoned, the cost of the transmission infrastructure is not economically justified. DESC's ratepayers should be protected from payment of these costs.

Q. PLEASE DESCRIBE THE PRESENT CONDITION AND DISPOSTION OF THE TRANSMISSION INFRASTRUCTURE PROJECTS.

A. As we have determined, the massive transmission expansion on the DESC system between 2009 and today was driven totally by the construction of VCSN units 2 and 3. The cost issues and construction delays that plagued that project since the time of its inception caused it to be canceled in 2017 At that time, the transmission system expansion that was justified on the basis of the plant's successful completion was either complete or nearly complete. The questions then become: 1) Are those projects justified on an operational and economic basis? 2) What should be the rate of return allowed on them? and 3) What additional rate burden should be placed on DESC's ratepayers if the prime reason for these projects no longer exists?

Joseph Wade Richards testified in Docket No. 2017-370-E, that the additional transmission capacity is justified on the merits of creating an expanded transmission backbone that makes power flow from North to South better in terms of losses, reliability, and voltage performance. There is no doubt that is true. And it is also true that the existing generation portfolio of 5,840 MW for 624,000 distribution customers which comprises the DESC system currently does get some benefit from these projects though it is marginal at best without the construction of VCSN units 2 and 3. Power flow in the region will not change to the extent that it would have had the VCSN units been completed and made operational. The VCSN project represented a complete alteration in that power flow not only on the DESC system but for the interconnection utilities. Mr. Richards' testimony in Docket No. 2017-370-E is attached hereto as Exhibit 3 to my direct testimony.

On page 7 of his testimony in Docket No. 2017-370-E Mr. Richards talks about the performance of the prior transmission assets being lower than those planned and installed. He takes on the notion of reliability and maintenance as the drivers for the new transmission construction.

In terms of overall reliability, he mentions major storm issues and it is assumed that the newer forms of construction with steel poles and monopole construction will be better able to survive such calamity. That may or may not be true. One of the big questions not answered in this regard is: what is the long-term history of major storm performance of the BES including the cycle of major storms and what effect do they have on the system? We do know that major storms like Hugo in 1989 can do major damage to any electric system, but the great majority of that damage is always on the distribution system.

If storm damage is a driving force, then the question becomes: how has the system performed under those conditions and how often can we expect to see these conditions repeated? This is important because there has to be an economic reason to deploy these assets to require the ratepayers to pay for the costs of these upgrades. That information is missing from the testimony. While it is likely the case that steel pole construction does provide better performance under adverse conditions, that performance is likely marginal and is more dependent on maintenance practices as opposed to construction practices which we will address shortly below.

On major transmission and BES infrastructure the best way to ensure reliability is to build multiple routes and have redundant infrastructure and have multiple points of failure as opposed to single sourcing. The transmission infrastructure built to deliver power from VCSN 2 and 3 required that investment. And it is very expensive to provide that level of reliability. Absent the nuclear plants in service, the added cost for reliability of these transmission assets appears to be more of a luxury than a necessity. If overall storm and system reliability were the benefits needed, then investment in distribution plant and O&M would provide far more benefit for far less cost.

Q. WHAT ADDITIONAL JUSTIFICATION DOES DESC GIVE FOR RECOVERING THE TRANSMISSION INFRASTRUCTURE IN RATES?

A. Another apparent justification is maintenance cost on old transmission lines versus new transmission lines. The problem here is that transmission maintenance is largely about right- of-way maintenance. Not that we do not change out poles that are old or replace other infrastructure, but by and large, the maintenance costs for the transmission infrastructure constructed with VCSN 2 and 3 are not going to be very different simply because managing the right of way and keeping it cleared is going to be a very similar cost for old lines versus new lines. In fact, because more assets are now deployed, the O&M costs will increase in order to manage those assets.

If DESC were only replacing existing assets, it is possible that some argument could be made to justify a rate base increase because better and less expensive maintenance would be a potential benefit. However, since DESC has actually deployed more lines and has more line mile exposure of the system, the O&M costs increase. Therefore, any benefit is limited at best because of additional deployment and the costs to maintain those assets which absent the VCSN deployment are unnecessary to provide the same level of service on the system at large.

Q. DOES THE FACT THAT THE PUBLIC SERVICE COMMISSION FOUND THE CONSTRUCTION TRANSMISSION ASSETS TO BE PRUDENT IN SCE&G'S BASE LOAD REVIEW PROCEEDING IN 2008 HAVE AN IMPACT IN THIS PROCEEDING?

A. No. On page 9 of Mr. Richards' testimony in Docket No. 2017-370-E, he committed in effect that the transmission upgrades were approved along with the VCSN project as prudent. However, at no point did the Public Service Commission approve these upgrades or look at them as prudent without the construction of VCSN 2 and 3. However, as I testified earlier, the Public Service Commission held in Order No. 2018-804 that DESC would be permitted to seek recovery of the cost of transmission infrastructure constructed to support the installation of VCSN 2 and 3 in the amount of $322 million in a subsequent proceeding. Order No. 2018-804 at pages 53-54.

Q. PLEASE ADDRESS THE OTHER BENEFITS DESC ADVANCES TO JUSTIFY THE RECOVERY OF THE TRANSMISSION INFRASTRUCTURE COSTS FROM RATEPAYERS.

A. DESC suggests that the new transmission infrastructure provides other system wide benefits from the deployment of these assets. An example would be system losses. It is true that system losses are always present and represent a cost to the company and the ratepayer. Efforts to limit system losses are undertaken by utilities as a strategic initiative due to their costs. Having been involved with system planning and design for nearly 40 years, we do look at losses as a consideration in any infrastructure deployment. It is also the case that utilities around the nation have programs to encourage energy efficiency programs to cut costs across the board to rate payers and the company. Effective loss management by a utility can provide less cost to the rate payer and a better return for the stockholder. So, it is no doubt a very serious matter and one that should be addressed. It is also the case that in the electric utility environment, losses at time of system peak are the most expensive losses.

However, on page 22 of his testimony in Docket No. 2017-370-E, Mr. Richards states these deployments, as constructed without the VCSN, will result in an 11 MW loss reduction at time of system peak and that this is significant. While it is likely true that 11 MW of loss reduction will occur, it is also true that this is insignificant for the following reasons:

- Presently, as stated above, the DESC system has 5,840 MW of generation to serve native load. 11 MW of losses represent only 0.19% of all generation capability. And would happen only at the time of the system peak. In reality this is a very insignificant metric and certainly cannot stand the test of economic justification to the ratepayers of South Carolina as a legitimate reason for them to pay for it at present.
- Peak demand time only lasts for several hours a year so this loss reduction across the board is more like 50% of this number on a total annual basis, which does not justify the ratepayer being burdened with all of this cost today for minimal benefit as shown here.

Q. PLEASE ADDRESS THE VALUE OF OTHER TRANSMISSION INFRASTRUCTURE PROJECTS CONSTRUCTED AS A PART OF THE CONSTRUCTION OF VCSN 2 AND 3.

A. There were a number of components of the transmission infrastructure constructed as a part of the VCSN 2 and 3 project that have limited value to the system or the ratepayer today now that the plants have been cancelled. An example would be the statement on page 22 of Mr. Richards' testimony in Docket No. 2017-370-E that the same benefits accrue from these projects as were laid out in 2008. As we see from the above, that is not a true statement. My testimony regarding system losses and O&M alone make that obvious. It is also the case that neither SERC nor NERC require a transmission expansion of this magnitude to enhance power flow through the region at present. The entire reason for this deployment was the construction of the nuclear plant itself, not any system issues that were identified across the board.

Q. YOU MENTIONED A BENEFIT FROM THE CONSTRUCTION OF A 230 KV LINE NEAR BLYTHEWOOD, SOUTH CAROLINA. SHOULD RATEPAYERS BE REQUIRED TO PAY FOR THIS LIMITED BENEFIT?

A. As I testified above, the VCS1 – Killian 230 kV project to relieve loading in the I-77 area as prescribed in 2008 was justified on about a 25% basis to provide relief in this growing area. As VCSN 2 and 3 provided 75% of the justification for the construction of the VCS1 – Killian 230 kV project, it would appear that the rate base now should probably only absorb that lesser percentage of costs based on the percentage of benefit.

Q. DOES DESC SUGGEST THE TRANSMISSION INFRASTRUCTURE CONSTRUCTED AS A PART OF THE CONSTURCTION OF VCSN 2 AND 3 PROVIDES OTHER SYSTEM BENEFITS?

A. Also mentioned are capacity upgrades for 8 high voltage transformers (230 kV and 115 kV) throughout the system. With the abandonment of VCSN 2 and 3, DESC projects that the upgrades are needed to correct NERC and long-range planning issues that will arise in 2028 If we are waiting for benefits in 2028 why would the ratepayer be responsible for paying for them now?

Another example would be the Saluda Hydro to Bush River 115 kV project to upgrade that line. In a world where VCSN 2 and 3 are operational, it is a fact that power flow between the hydro facility and the rest of the system would be much more dynamic and a capacity upgrade would be justified under those conditions. However, absent that being the case the justification now appears to be replacing existing lattice towers with modern monopole construction. That is at best a questionable benefit to the system and of no benefit to the ratepayer at this time. This project should be removed from consideration unless obvious benefits are presented to support this upgrade that are not now present.

Mr. Richards' testimony in Docket No. 2017-370-E on page 21 also mentions, along with the high voltage transformers, about 37 other 230 kV and 115 kV lines that are overloaded and will need to be dealt with again in response to issues projected in 2028. Again, these are projections and if we are waiting to get benefit in 2028 then why should the ratepayer be on the hook for them today?

Q. PLEASE SET OUT YOUR CONCLUSIONS, MR. MCGAVRAN.

A. My analysis of the transmission costs incurred in connection with the construction of VCSN 2 and 3 for which DESC seeks recovery in rates compels the following:

- All the projects we are discussing were approved by the Public Service Commission in 2009 as prudent to support the construction of VCSN units 2 and 3. Nothing else justifies any of these projects. As such they have to be critically examined in light of the cancellation of that project for admission into the rate base before those costs passed on the rate payers of South Carolina.

- Benefits such as system loss reduction and enhanced power flow without the VCSN project in service appear to be of very limited scope and not worth the economic impact placed on the ratepayers.
- Benefits accruing from system reliability as regards major storm damage are limited by these upgrades. If DESC were interested in limiting storm damage, it would deploy capital into distribution system hardening in terms of right of way maintenance and system redundancy. Likewise, the redundancy provided by these transmission projects was needed to enhance power flow on the BES with the VCSN project in operation. As that is no longer the case these projects are in effect an overkill that while they do provide benefit, those benefits are the result of a massive deployment of assets that are unnecessary given current conditions.
- O&M savings are nonexistent because we are not just replacing existing assets; we are adding new assets to service power delivery that is no longer necessary. As such additional maintenance, not less maintenance will be required to keep these new assets performing and to keep existing assets performing.
- Benefits accruing in out years should not be placed as a burden on ratepayers today.

I conclude that while there are some benefits to all of these projects, they were not intended to provide benefits without the addition of VCSN 2 and 3. It is my ultimate conclusion that what we have here is a situation where costs are very high and actual consumer benefit is very marginal. DESC has not justified recovery of these costs in rates.

Q. **DOES THIS CONCLUDE YOUR PREPARED DIRECT TESTIMONY?**

A. Yes.

Appendix A

Edward G. (Ted) McGavran III, P.E.

Contact Information
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Date of Birth:	December 3, 1959
Place of Birth:	Charleston, West Virginia
Citizenship:	United States of America
Sex:	Male
Marital Status:	Married (Wife, Melanie McGavran)
Children:	One (Son, Edward McGavran)

Professional History:

April, 1991 to Present:
President & Owner
McGavran Engineering, P.C.

Consulting engineering practice started in 1991 to work with rural power systems in the Southeastern United States. Clients include municipally owned power systems, investor owned utilities, industrial power systems, electrical testing contractors, and other professional firms. Projects and tasks include, but are not limited to the following:

- Engineering and operations management reviews and operational plans for rural electric cooperatives.
- System planning for long and short range plans including distribution and transmission system analysis, design, least cost planning, economic analysis, and alternative plans.
- Studied reliability as a critical component of electric system planning criteria. Rank order projects on an objective criteria based on resources available and long term financial models to determine outcomes.
- Manage and design projects for up to 345 kV transmission lines, substations, and underground and overhead distribution projects. In conjunction with the management of these projects have prepared detailed construction contracts for bidding, evaluate and award bids, oversee the construction process, closeout the contracts, and settle any issues regarding damages to property by the contractor as well as final acceptance certification and testing.

- Oversee system mapping projects and gather GPS data.
- Write and submit Environmental Assessments for power system capital projects including transmission lines, substations, and distribution lines.

- Prepare Spill Prevention and Countermeasure Control Plans for electric substations and operational headquarters facilities. Also prepare and rehearse Emergency Action Plans in conjunction with SPCC regulations.

- Prepare coordination and sectionalizing studies for rural power systems. Studies include relay coordination analysis for transmission lines, substations, and distribution breakers, and down to the distribution line level. Perform system fault current studies for transmission, distribution, and industrial systems.

- Prepare system load flow studies for electric transmission and distribution systems. Analysis has included contingency planning and power factor impact on system voltage levels and losses.

- Work with FERC re-licensing of Catawba River Watershed by locating, surveying, and certifying distribution line crossings over the watershed. Have brought substandard crossings up to NESC and Corps of Engineers requirements based on survey and engineering analysis of the sag and tension of the electric line crossing as determined in the analysis.

- Design and perform feasibility studies for standby generator projects for industrial clients on rural and municipal electric systems including PURPA certifications.

- Select routes and sites for substation and transmission line projects. Work with right of way acquisition to attain the best routes and sites possible for these projects in an imminent domain environment. Give expert testimony to utility commissions and state courts regarding necessity, route selection and impacts for both plaintiffs and interveners on projects up to 345 kV.

- Provide expert witness testimony and litigation support in Civil cases including electrical contacts with electric power lines, industrial faults leading to damaged facilities and/or loss of product, condition of electrical equipment, joint use and pole attachment issues including but not limited to attachment rates, contract language, illegal attachments and safety issues

- Perform system work order inspections for rural electric systems to certify that work has been done to the standards required by the Rural Utility Service.

- Perform pole attachment and joint use rate analysis, contract negotiation, attachment and NESC violation audits. Set up and manage compliance programs, joint trench projects, as well as run client joint use programs on an outsource basis. Clients include electric coops and municipal electric systems throughout the US. Manage and perform violation clean up and basic OSP remediation for copper, fiber, and power facilities on utility pole lines. Worked with NCEMC to develop state legislation regarding pole attachment, rates, rights, violations, and reporting on electric coops and municipal systems poles. Provide expert testimony to state and federal courts regarding pole attachment practices and rate design.

Outside plant design for fiber systems for utility SCADA and associated "smart grid" projects including but not limited to overhead and underground fiber and copper plant development, radio communications infrastructure, telephone line leasing, T-1 circuit coordination. Also did comprehensive analysis of Broadband over Power lines for several cooperatives.

Write fiber optic feasibility studies for electric coops that included cost estimates for deployment and basic system network design. Included marketing analysis for enterprise applications, as well as SCADA, metering, and other "smart grid" applications. Include system rate of return and business case analysis.

Oversee design of a complete fiber to the home system completion for RUS telecom borrower.

Oversee and design renewable energy projects utility scale from 1 – 100 MW. Duties include as follows:

Utility interconnection design and negotiation, from 12.47 kV to 345 kV level. Includes all relaying and communications, as well as substation siting and approval. Dealt with complex communications and fiber optic designs for reliable system monitoring, metering and protection. Includes solar and biomass projects throughout the Southeast United States. Includes system one line electrical design and certification as Professional Engineer. Prepare both FERC LGIP and SGIP interconnection applications for major utility projects including PJM RTO projects.

Give expert testimony on support for conditional use permits for major solar sites 5 MW and above to towns and counties.

Prepare system feasibility and impact studies for utility grade solar projects 5 MW and above for both utilities and solar providers. Includes voltage swing and fault current impacts, system and conductor loading, and system protection design as well as cost estimation for upgrades required for service.

Prepare decommissioning reports for utility grade solar projects as required for conditional use approvals and certify plans as Professional Engineer of record.

Oversee design of both AC and DC components for entire utility grade solar projects 5 MW – 100 MW and above and for utility grade wind projects over 100 MW with 345 kV transmission line design and routing.

Write and certify commissioning reports for tax credit and investors for biomass projects in Eastern NC.

Write and certify Engineer's report attesting to percent complete to qualify for North Carolina state tax credit in 2015 for solar sites throughout North Carolina. Included on the ground system inspection certification as well.

Give expert testimony to Pennsylvania Public Service Commission regarding actual system impact of solar site on PPL distribution lines. Was able to get cost reduction of system impacts reduced from $3,200,000 to $32,000 for the PPL customer.

Prepare engineering analysis for purchase of smaller scale run of the river hydro projects for both electric coops and private investors.

Prepare Emergency Action plans for smaller scale run of the river hydro projects both new and existing up to 20 MW.

Prepare system designs for system protection and interconnection for hydro projects as above up to 20 MW.

2005 to 2009:
Board Member and Partner
Facility Planning and Siting, LLC
421 Penman Street, Suite 100
Charlotte, NC 28203
Phone: 704.926.3781
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Board member and partner interest in Landscape Architecture firm, which had been a business unit of Framatome AMP and Duke Engineering Services. Company performs detailed siting analysis for major electric transmission lines, substations, generation stations including fossil and nuclear plants, site design for substations, litigation support for utility right of way acquisition including conditional use permits, environmental permitting services, NPDES permits, as well as the same services for private commercial projects.

- Company was established as an independent business in February, 2006.
- Clients include Duke Energy, Central Electric Power Coo along with numerous electric cooperatives in the Carolinas. Major Generation projects included the Duke W.S. Lee Nuclear Plant and the Cliffside Coal fired power plant.

June 1984 to April 1991:
Electrical Engineer
Electrical Consulting Engineers, Inc.
2407 North Tryon Street
Charlotte, North Carolina 28206
Phone: 704.372.6673
Fax: 704.334.2607
Email: jkuhn@e-c-e.net
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- Performed design calculations, spot structures prepare bid documents and manage 115 KV and 69 KV Transmission Line Projects.
- Prepared two year work plans and system planning reports for rural Electric Cooperatives in North Carolina and Virginia.
- Performed sectionalizing and coordination studies for Cooperatives in North Carolina.
- Assisted with field relay tests and substation start-ups.
- Performed design, bid and closeout for 115, 44 & 69 - 12.5 kV substation projects.
- Prepared borrower's environmental reports and
- Performed work order inspections.

May 1982 to December 1983:
Power Supply Technician
North Carolina Electric Membership Corporation
3400 Sumner Blvd.
Raleigh, NC 27616
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Worked as a power supply technician while I was an engineering student at NC State University and was heavily involved in the following projects:

- Analyzed RTU deployment for statewide load management and SCADA system. Used SAS statistical analysis to deploy RTUs throughout the state of North Carolina to minimize total deployment costs. Also worked on deployment of statewide communications system for load management and SCADA system that included am radio, microwave communications, leased phone and T-1 circuits, and dedicated fiber optic mediums.

- Worked with staff to analyze NCEMC financial models for the Catawba Nuclear plant purchase from Duke Energy.

- Developed model to analyze lease-purchase decisions for leased delivery points for coops with leased deliveries on the Duke Energy system.

- Worked to develop statewide transmission system asset base and map for all North Carolina Electric Cooperatives.

Educational Background:

1974 – 1978	Northwest Cabarrus High School, Concord, North Carolina Graduated – 1978, College preparatory study track
1978 – 1984	North Carolina State University, Raleigh, North Carolina Graduated – 1984 Bachelor of Science in Electrical Engineering

Professional Qualifications and Affiliations:

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References:

Provided Upon Request